

FIRST ARTICLE TEST PLAN

For The

TYPE 1 CONFIGURATION

(CARRY-ON) TRANSPONDER

U.S. Coast Guard Command and Control Center (C2CEN)
Portsmouth, Virginia
6 April – 10 April 1998

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EXECUTIVE SUMMARY

The First Article Test Plan for the Type 1 Configuration (Carry-on) Transponder has been developed for the Ports and Waterways Safety System (PAWSS) Vessel Traffic Services (VTS) System Developmental Test and Evaluation (DT&E) Program.

The DT&E First Article Test will be conducted during the period 6 – 10 April 1998 at the Coast Guard Command and Control Center (C2CEN), Portsmouth, VA. The testing at C2CEN will be conducted in two phases:

- **Phase I First Article Test for Transponder Acceptance.** Two Type 1 Configuration (Carry-on) Transponders will undergo a First Article Test for unit acceptance to ensure marine band very high frequency (VHF) Digital Selective Calling (DSC) transponders are capable of supporting the VTS system deployment and System Integration Contractor (SIC) DT&E activities at New Orleans, LA. The First Article Test will test for DSC base station compatibility. With the transponder units in a shipboard environment it will test for compliance with Draft Revisions of Recommendations ITU-R M.825-1 (hereafter referred to as revised 825-1) and ITU-R M.1084-1. The Type 1 configured transponders must be able to send and receive revised 825-1 messages, recognize ship calls, and operate on 25 kHz and 12.5 kHz channels. If Phase I testing demonstrates successful acceptance of the Type 1 configured transponder, the Coast Guard will issue a delivery order for additional transponders. The Contractor may elect to have an observer present during testing.
- **Phase II Additional Tests.** Additional tests will be conducted after successful completion of the First Article Test. Signal generators will be used to test for susceptibility to interference from high-power emitters and signal degradation. Transponder safety and configuration requirements will be verified. Reliability, Maintainability and Availability (RMA) Predictions and survivability features of the transponders will be reviewed to determine that performance requirements most likely would be achieved in an operational environment.

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SECTION 1. INTRODUCTION

1.1 Identification.

The First Article Test Plan for the Type 1 Configuration (Carry-on) Transponder has been developed for the Ports and Waterways Safety System (PAWSS) Project Vessel Traffic Services (VTS) System Developmental Test and Evaluation (DT&E) Program.

1.2 Test Overview.

The First Article Test is scheduled to be conducted during the period 6 – 10 April 98. The contractor will deliver to C2CEN, Portsmouth, VA, as specified by the *Automatic Identification System (AIS) Transponder Contract* two Type 1 Configuration (Carry-on) Transponders to be designated First Article Test Units. The testing at Portsmouth will be conducted in two phases:

- **Phase I First Article Test.** Two Type 1 configured transponders will undergo a First Article Test for unit acceptance to ensure marine band very high frequency (VHF) Digital Selective Calling (DSC) transponders are capable of supporting the VTS system deployment and System Integration Contractor (SIC) DT&E activities at New Orleans, LA. The Type 1 configured transponders will be tested for compatibility with the C2CEN DSC base station (hereafter referred to as the base station). The First Article Test will test the units in a shipboard environment for compliance with Draft Revisions of Recommendations ITU-R M.825-1 (hereafter referred to as revised 825-1) and ITU-R M.1084-1 (hereafter referred to as revised 1084-1). See the Glossary (Encl. 2) for further clarification of the recommendations. The Type 1 configured transponder must be able to send and receive revised 825-1 messages, recognize ship calls, and operate on 25 kHz and 12.5 kHz channels. If the Phase I testing demonstrates successful acceptance of the Type 1 configured transponder, the Coast Guard will issue a delivery order for additional transponders. The Contractor may elect to have an observer present during the testing.
- **Phase II Additional Tests.** Additional tests will be conducted after successful completion of the First Article Test. Signal generators will be used to test transponders for susceptibility to interference from high-power emitters and signal degradation. Safety and configuration requirements will be verified. Reliability, Maintainability and Availability (RMA) Predictions and the survivability features of the transponders will be reviewed to determine that performance requirements most likely would be achieved in an operational environment.

The scope of this test plan will address primarily verification activities associated with the Phase I First Article Test for Type 1 configured transponder unit acceptance. Phase II test verification and review activities are included in this plan to conduct additional testing after successful completion of Phase I testing.

1.3 First Article Test Objectives.

- Verify all equipment, subsystems, and completed Type 1 configured transponder units are compatible with the C2CEN base station.
- Verify the Type 1 configured transponder test units are in compliance with revised 825-1 and revised 1084-1.

1.4 Purpose of the First Article Test Plan.

Establish a comprehensive test program to conduct a First Article Test in accordance with testing and delivery requirements (paragraph 3.7) in the *Specification for the AIS Transponder*.

Communicate to the testers the nature and the extent of the test deemed necessary to provide a basis for Type 1 configured transponder unit acceptance by the Coast Guard.

Provide guidance for the management and technical efforts necessary for the duration of the Phase I and Phase II testing

1.5 Support Organizations.

- The National Telecommunications and Information Administration (NTIA) provides G-AVT DSC/AIS test support.
- Institute of Telecommunications Sciences (ITS) provides NTIA with communications test support.
- C2CEN provides G-AVT a DSC base station and administrative facilities support.
- SETA supports G-AVT with system engineering and test support.

1.6 Document Organization.

This First Article Test Plan is prepared in accordance with COMDTINST M4150.2E, Systems Acquisition Manual (SAM), the PAWSS Test and Evaluation Master Plan (TEMP) and the VTS DT&E Plan. Reference documents are listed in Enclosure 1. The Glossary, Acronyms and Abbreviations are listed in Enclosure 2. The Description of Type 1 Configuration Transponder First Article Test Items, Additional Test Items and Schedule are at Enclosure 3. The First Article Test Checklist and Additional Tests Checklist are at Enclosure 4. The First Article Test Operator's Log and Transponder Data Log are at Enclosure 5.

SECTION 2 FIRST ARTICLE TEST OVERVIEW

2.1 Test Site.

The Phase I First Article Test and Phase II Additional Tests will be conducted at C2CEN, Portsmouth, VA. Tests will be conducted during normal work hours in a controlled environment at or remote from the C2CEN facility communicating to and from designated land sites, land vehicles and maritime ships.

2.2 Test Schedule.

The First Article Test for Type 1 configured transponder units acceptance will be conducted during the period 6 – 10 April 1998. Phase II testing will follow successful acceptance of the carry-on transponder units. The test stages, events and schedule are described in Enclosure 3.

2.3 Test Software.

Commercial Command and Protocol Instruction Set Test Software. Test software emulates the base station operator sending and receiving messages and records information pertinent to any specific activity. The base station operator could manually enter messages and log actions, if applicable.

2.4 Type 1 Configuration Test Units.

Two carry-on units consisting of three functional elements: (a) a GPS/DGPS based vessel position subsystem, (b) a VHF/DSC radio communications subsystem, and (c) a display subsystem. Carry-on transponders shall be in hard-shelled containers that weigh not more than 20 pounds, inclusive of all three physical components, and shall operate in a marine environment.

Ship's power (110 – 240 AC) may be used as the main power source for Type 1 transponders. Any physical component operated separately from the ship's power source shall have a self-contained power source which provides for a minimum of 8 hours of non-interrupted use. A back-up battery for at least one hour is required to operate any physical component using ship's power.

2.5 Test Hardware.

One C2CEN revised 825-1 compatible DSC base station with an AIS workstation.

One C2CEN revised 825-1 compatible transponder at a fixed site to be used as an integrity monitor during the tests to ensure the base station is operating properly.

2.6 Communications, Vessel Support and Other Equipment

Communications (frequencies, etc.), vessel support and other test resource requirements are described in Enclosure 3.

2.7 Contractor Deliverable Materials.

Contractor supplied materials as specified in the contract will be delivered to the test site as listed below.

- Two Type 1 Configuration (Carry-on) Transponder Units
- ~~RMA Predictions~~
- Technical Manual and Installation Sheet with each carry-on transponder unit.

2.8 C2CEN Administrative Facilities Support.

Administrative facilities support items are needed at the test site as listed below:

- Work area for the test team, including tables and chairs for approximately eight personnel.
- Access to a personal computer (PC) and printer.
- Access to a copier, commercial telephone and facsimile equipment.

2.9 Test Personnel Requirements.

First Article (Phase I) testers will be three representatives from NTIA (one for Phase II testing from ITS), two representatives from G-AVT, one representative from G-MOV, one representative from G-SCE and two representatives from SETA. G-AVT3 will be the Test Director. Two auxiliary Coast Guard vessel crews will provide maritime support. The Contractor may elect to have an observer present during testing.

2.10 Training.

The Contractor will provide transponder operator training to test personnel.

SECTION 3 FIRST ARTICLE TEST OUTLINE

3.1 General Information.

This First Article Test Plan is designed to ensure that the Type 1 Configuration (Carry-on) Transponder is in compliance with revised 825-1 and revised 1084-1. It is also designed to determine if the Type 1 configured transponder meets other contract technical and operational requirements (Phase II Additional Tests).

3.2 Test Level.

The Phase I First Article Test and the Phase II Additional Tests will be at the system level.

3.3 Test Verification and Review.

Test verification and review shall demonstrate the technical and operational effectiveness and suitability of the Type 1 configured transponder units as follows:

Phase I First Article Test

- Verify the Type 1 configured transponder is able to effectively interface with the DSC base station.
- Verify the VHF/DSC radio provides 25 kHz capability (revised 1084-1).
- Verify the VHF/DSC radio provides 12.5 kHz capability (revised 1084-1).
- Verify the transponder transceiver is capable of accepting instructions to operate on any VHF channel allocated to VTS data services (revised 1084-1).
- Verify the Type 1 configured transponder accurately produces information pertinent to the revised 825-1 Annex 1 and Annex 2.

Phase II Additional Tests (not a First Article Test requirement)

- Verify the Type 1 configured transponder will operate in the presence of high-powered signals described in Enclosure 3 for Phase II testing.
- Verify the Type 1 configured transponder component operating separately from the ship's power source has a self-contained power source that provides a minimum of 8 hours of non-interrupted use.
- Verify the transponder display subsystem is capable of displaying electronic chart formats.
- Verify all three subsystems of the Type 1 configured transponder is capable of quick, easy mounting for installation and connecting to the ship's power.
- Verify the self-contained power source is rechargeable using a 110 –240 AC power source.

- Verify the Type 1 configured transponders are in hard shell containers and do not weigh more than 20 pounds, inclusive of all three physical components, and operates in a commercial marine environment.
- Verify the carry-on transponder component, power cable, or information cable or wire does not lie on the vessel deck, interfere with the operation of the vessel, or present any tripping hazard.
- Review that the carry-on unit external physical components most likely (probable expectation) will withstand winds up to 65 knots.
- Review RMA Predictions that the Type 1 configured transponder most likely (probable expectation) will have an inherent availability of at least 99.75% in an operational environment.

Test Evaluation

- Evaluate Phase I Test (First Article Test) results to ensure that all stated test objectives have been met, or that sufficient justification and potential impact is given for those objectives to be met.
- Evaluate Phase II Test results to determine that the transponder technical and operational capabilities meet requirements.

3.4 Extent of Testing.

The Phase I First Article Test will ensure a comprehensive verification process is conducted using representative evaluation criteria as described by the First Article Test Items (Encl. 3) and the First Article Test Checklist (Encl. 4). This test is scheduled to be conducted on the third test day with equipment set-up and checkout occurring the first two days of the test period. A test report will be forwarded to G-AVT at the conclusion of this test.

The phase II Additional Tests will ensure a comprehensive verification and review process is conducted using representative evaluation criteria as described by the Additional Tests Items (Encl. 3) and the Additional Tests Checklist (Encl. 4). Phase II Tests are scheduled for the fourth and fifth day of the test period. Lessons learned will be developed after the conclusion of Phase II testing to include incorporating lessons learned from Phase I testing into the overall report.

3.5 Test Control.

The Test Director (G-AVT3) will direct the overall conduct of the test as listed below:

- Following the test items and the test procedures script described in Enclosure 3 and listed in the First Article Checklist (Encl. 4) will accomplish all tests.
- The First Article Test Checklist (Encl. 4) and the Additional Tests Checklist (Encl. 4) will be used to record test activity results.

- As each evaluation point is completed an annotation will be made on the appropriate test checklist.
- Testers will record any significant events that occur during Phase I and II test periods in the First Article Operator's Test Log (Encl. 5) and in the Transponder Data Log (Encl. 5), as applicable.
- A status meeting will be conducted daily and at the end of the test period.

3.6 Test Termination.

The Test Director in coordination with G-AVT will determine when the First Article Test is to be terminated. The following applies:

- The test team will review and evaluate test outputs and provide recommendations to the Test Director, as applicable
- If the First Article Test verification process determines the revised 825-1 and revised 1084-1 requirements have not been met, the Type 1 configured transponder cannot be considered acceptable.
- If the Type 1 configured transponder unit is not initially accepted, the Contractor, at the request of the Government, shall submit another Type 1 configured transponder unit for testing.
- Extension of the initial test period will be made with approval of G-AVT.
- Successful completion for Phase I testing will be determined based on input from the test team and successful processing of all First Article Test verification items.
- Phase II testing will be conducted after successful completion of Phase I testing.

3.7 First Article Test Report.

The test team will prepare and submit to G-AVT the First Article Test Report, summarizing test findings after completion of the Phase I testing. If the First Article Test demonstrates successful acceptance of the Type 1 configured transponder, the Coast Guard will issue a delivery order for additional transponders to the Contractor.

3.8 Transponder Lessons Learned Report.

The Transponder Lessons Learned Report will be submitted to G-AVT the week following completion of both phases of testing at C2CEN. Lessons learned will be used to refine testing criteria for any additional transponder acceptance tests and transponder evaluation testing at Gretna Light, New Orleans, LA.

ENCLOSURE (1) - REFERENCE DOCUMENTS

- [1] Test and Evaluation Master Plan for Ports and Waterways Safety System, 4 December 1997
- [2] Developmental Test and Evaluation Plan for Vessel Traffic Services, 30 January 1998
- [3] Specification for the Automatic Identification System Transponder, 21 January 1998
- [4] Systems Acquisition Manual, COMDTINST M4150.2E, 11 December 1997

ENCLOSURE (2) – GLOSSARY, ACRONYMS AND ABBREVIATIONS

Glossary

Document 8/1015-E (date 3 July 1997) Draft Revision of Recommendation ITU-R

M.825-1: Document was approved at the ITU Radio Assembly meeting in October 1997. As a result of this approval, the Draft Revision of Recommendation ITU-R M.825-1 has been superseded by ITU-R M.825-2. This document will be released by the ITU in the near future, but is not currently available. These two documents are technically the same, and a transponder meeting either document is technically acceptable.

Document 8/1012-E (date 2 July 1997) Draft Revision of Recommendation ITU-R

M.1084-1: Document was approved at the ITU Radio Assembly meeting in October 1997. As a result of this approval, the Draft Revision of Recommendation ITU-R M.1084-1 has been superseded by ITU-R M.1084-2. This document will be released by the ITU in the near future, but is not currently available. These two documents are technically the same, and a transponder meeting either document is technically acceptable.

Inherent Availability (A): Inherent Availability is the probability that a system or equipment when used under stated conditions, without consideration for any scheduled or prevention action, in an ideal support environment, shall operate in satisfactory condition at a given point in time. It excludes ready time, preventive maintenance downtime, logistics time, and waiting or administrative downtime. A may be expressed as: $A = \text{MTBF} / (\text{MTBF} + \text{MTTR})$ where MTBF is mean time between failure and MTTR is mean time to repair.

Mean Time Between Failure (MTBF): A measure of merit of the reliability of a configuration item, defined as the average length of time between failure occurrences. In this context, failures arising from external causes are excluded, and all inherent failures are included.

Mean Time to Repair (MTTR): A measure of merit of the maintainability of a configuration item, defined as the average length of time needed to repair or replace a failed item. In this context, all forms of wait time are excluded.

Acronyms and Abbreviations

AC	Alternating Current
AIS	Automatic Identification System
C2CEN	Command and Control Center
Cond	Continued
dBm	Power reference to a milliwatt
DG	Dangerous Goods
DSC	Digital Selective Calling
DT&E	Developmental Test and Evaluation
Encl.	Enclosure
GPS/DGPS	Global Positioning System/Differential GPS
Hs	Harmful substances
Hz	Hertz
IM	International Maritime Organization
ITS	Institute of Telecommunications Sciences
ITU	International Telecommunications Union
kHz	kilohertz
LA	Louisiana
MP	Marine Pollutants
NTIA	National Telecommunications and Information Administration
PAWSS	Ports and Waterways Safety System
PC	Personal Computer
RF	Radio frequency
RMA	Reliability, Maintainability, and Availability
SAM	Systems Acquisition Manual
SIC	System Integration Contractor
TEMP	Test and Evaluation Master Plan
VA	Virginia
VHF	Very High Frequency
VTs	Vessel Traffic Services

ENCLOSURE (3) - DESCRIPTION OF TYPE 1 CONFIGURATION TRANSPONDER FIRST ARTICLE TEST ITEMS, ADDITIONAL TEST ITEMS AND SCHEDULE

A. Introduction.

The Type 1 Configuration (Carry-on) Transponder (hereafter referred to as the transponder) will be tested in two phases. Phase I will test the transponder compatibility with revised 825-1 Annex 1 and Annex 2 messages, its ability to recognize ship calls, and to operate on 25 kHz and 12.5 kHz simplex or duplex channels (revised 1084-1). Phase II will test the Type 1 configured transponder capability to meet the other contract technical and operational requirements. Phase II also will test the transponder susceptibility to interference from high-power emitters, signal degradation, co-site emitters, and environmental tests. Certain parts of Phase II will only be tested at C2CEN if time and resources permit. Otherwise, additional testing will be performed at Gretna Light, New Orleans. A more detailed description of First Article Test Items, Additional Tests Items and Schedule is discussed in the following paragraphs.

B. The Type 1 Configuration (Carry-on) Transponder Test Items.

The First Article Checklist (Encl. 4), the Additional Tests Checklist (Encl. 4), the Test Operator's Log (Encl. 5), and the Transponder Data Log (Encl. 5) are to be used in conjunction with applicable Phase I and Phase II testing.

1. Phase I First Article Test Items.

First Article Test items are discussed in the following paragraphs.

1.1 Compatibility with Annex 1 and Annex 2 Messages.

Revised 825-1 provides the symbol and message formats that comprise the VTS DSC protocols. The recommendation outlines the message structures and the types of calls that can be made to ships. Software will be used to validate the transponder's compatibility with Annex 1 and Annex 2 of the revised 825-1. It is called Commercial Command and Protocol Instruction Set Test Software (hereafter referred to as test software).

A description of the types of messages and ship calls that the test software operating on the C2CEN DSC Base Station (hereafter referred to as the base station) is described below.

The test software will exercise the transponder through these messages and record (in time) when the messages were sent or received. The messages shown below in Tables 1-1 and 1-2 are described in revised 825-1 Annex 1. This testing will

validate the transponder compatibility with Annex 1. Messages can be entered manually by the base station operator and actions recorded on a Log, if applicable.

Table 1-1 Annex 1 Symbols for Message Contents of VTS Calls

Symbol	Message
100	My position is....at time....(followed by 12 or 13 symbols)
101	Switch to VHF channel....for subsequent VTS DSC communications
102	Report your position now and at intervals of....minutes
103	Report your position
104	VTS expansion messages (see table 1-2)
105	Ship is leaving berth or anchorage or entering VTSA
106	Report next port of call
107	Ship is berthing, anchoring or leaving VTSA
108	Report length of ship
109	Report course of ship
110	Message acknowledged
111	Report ships name/identification
112	Acknowledge message
113	Report your destination information
114	My destination information is....followed by 13 symbols
115	Ships name/identification is....followed by several symbols
116	Report speed of ship
117	Not to be used
118	Report draught (draft) of ship
119	Course of ship is....degrees
120	Speed of ship is....knots
121	Next port of call is.....
122	Not to be used
123	Draught (draft) of ship is....meters and decimeters
124	Length of ship is....meters and decimeters
125	Not to be used
126	No information
127	Not to be used

A message may contain up to four symbols in a transmission sequence. The complete description of the messages can be found in Annex 1 of the recommendation. The VTS expansion messages are shown below in Table 1-2.

TABLE 1-2 Annex 1 Symbols for VTS Expansion Messages

Symbol	Message
00	Frequency channel
01	Transmitter power level
02	Differential corrections
03	Activate alternate system
04	Identification of alternate system
05	Ships heading
06	Navigation antenna placement
07	Ship's beam
08	Data text message

09-99	Spares
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These messages are used to supplement the messages in Table 1-1 and activate the high speed DSC transponder system as described in Annex 2 of the revised 825-1.

The features of Annex 2 are in full compliance with Annex 1 including 1200 baud operation, provision of a means of transmitting ports and weather maps to ships, provision of a means of transmitting data messages ship-to-shore, shore-to-ship, and ship-to-ship, and provision of four ships' position reports per second.

Annex 2 contains three types of commands: VTC Command List, Transponder Command List, and Transponder Request List. The commands are shown below in Tables 1-3 to 1-5.

Table 1-3 Annex 2 VTC Command List

Symbol	Command
100	Position request from list of transponder units
102	Text data for a transponder from VTC
104	System information update
106	Text data from a transponder to a transponder
108	Resume annex 1 operation
109	Ports data
110	Weather data
120	Update of transponder information
122	VTC command acknowledgment to a transponder
124	Differential Corrections

Table 1-4 Annex 2 Transponder Command List

Symbol	Command
100	Position data response
102	Text data for VTC
104	Text data for a transponder
106	Updated transponder information
108	Transponder command acknowledgment to VTC

Table 1-5 Annex 2 Transponder Request List

Symbol	Command
01	Request to send text data to VTC
02	Request to send text data to another transponder
03	Request for all transponder information update

A complete description of the messages and the format of the commands can be found in Annex 2 of revised 825-1.

1.2 Ability to Recognize Revised 825-1 Annex 1 and Annex 2 Ship Calls.

Annex 1 and Annex 2 allows calls to be made to a ship or groups of ships in a defined area. The ship types as categorized by 825-1 Annex 1 are shown below in Table 1-6.

TABLE 1-6 ANNEX 1 SYMBOLS TO INDICATE THE TYPE OF SHIP AND FOR THE ADDRESS OF CALLS TO GROUPS OF SHIPS IN THE VESSEL TRAFFIC SERVICES AREA (VTSA)

Symbols to be used by ships to report their type and in the address of calls directed to a group of ships in a VTSA	
Symbol No.	Special Craft
50	Pilot boats
51	Search and rescue vessels
52	Tugs
53	Port Tenders
54	Vessels with anti-pollution facilities or equipment
55	Law enforcement vessels
56	Spare for local vessels
57	Spare for local vessels
58	Medical transports
59	Spare for assignment to other special vessels
Other Ships	
First Digit	Second Digit
6- Passenger ships	0- all ships this type
7- Cargo ships	1- carrying DG, Hs, or MP IMO hazard or pollutant category A
8- Tankers	2- carrying DG, Hs, or MP IMO hazard or pollutant category B
9- Other types of ships	3- carrying DG, Hs, or MP IMO hazard or pollutant category C
	4- carrying DG, Hs, or MP IMO hazard or pollutant category D
	5- Not under command
	6- Restricted by her ability to maneuver
	7- Constrained by her draught
	8- Spare
	9- No additional information

To test compliance to Annex 1 ship calls, the transponder operator will change the configuration of the transponder so that it can be made to emulate each of the above ship types. The base station will then send out calls to each specific ship type to test the transponder ability to recognize itself as that type of ship and respond to the appropriate command/instruction. The base station test software will time-tag the calls and responses to each specific ship type. This recording will be used to verify that the transponder was able to answer calls to each ship type.

Annex 1 also allows calls to be made to a ship or ships on a particular course in a defined area. The transponder will be tested for compatibility to this feature of revised 825-1 by setting the test ships on a particular course and having the base station address that course in a call.

Compliance to Annex 2 will be tested by commanding the transponder through the message formats in Tables 1-3 to 1-5. Ships are addressed in Annex 2 by calling a group and sequence number. The transponders are assigned both a group number and sequence number by the base station when a transponder is switched to operation in accordance with Annex 2.

Test text messages will also be sent ship-to-shore, shore-to-ship, and ship-to-ship via a repeater through the base station. The base station test software will monitor and record the time of transmissions and the message itself.

1.3 Operation on 25 kHz and 12.5 kHz Simplex or Duplex Channels.

The transponder will be commanded by the base station to operate on simplex and duplex channels. The base station sends the command that instructs the transponder to go to the working channel as part of the revised 825-1 message formats. The transponder must recognize that the working channel is either simplex or duplex and if the channel is channelized at 25 kHz or 12.5 kHz then act accordingly. The base station test software will monitor the transponder activity to validate its operation on the correct channel.

1.4 Test Procedures Script.

The test procedures script is contained in Enclosure 4. The script includes a description of the shore-to-ship, ship-to-shore, and ship-to-ship (via repeater) tests that will be performed.

1.4.1 Verification Through Manual Commands.

To verify that the results of the tests are not dependent on test software, individual commands will be sent from the base station to the transponders without using test software. The transponder's responses to commands from the test software and the normal base station operating software will be compared to ensure that their outputs are the same. This will be done for selective commands.

1.4.2 Data Collection and Integrity Monitoring.

The base station software will record in time when each command or request for information was sent to the transponder and when the transponder reply was returned. The base station will generate a data file containing the record of the

transactions which will be used to verify that the transponder was sending/receiving the commands in a timely and accurate manner.

C2Cen has a permanent transponder operating from a rooftop antenna at their facilities. This transponder will be used as an integrity monitor during the tests to ensure that the base station is operating properly. The C2CEN transponder will be tested with the base station test software and the results will be compared to the first article test results.

2. Phase II Additional Test Items.

Test procedures script for Phase I testing will be used, as applicable, with Phase II test items. Test items are discussed in the following paragraphs.

2.1 System Recovery.

2.1.1 Transponder Power Loss.

The transponder will be tested for recovery from power loss by disconnecting it from its power source. The transponder will then be re-connected to the power source to validate that it can restore communications with the base station in the event of power loss.

2.1.2 Base Station Power Loss.

This test will not be performed at C2CEN. However, if the transponders have a limited ship-to-ship capability then this feature will be demonstrated by turning off the base station and observing the operations of the transponders. More detailed test procedures will be developed for this specific test in New Orleans with the operation of multiple high-sites. The test will examine the operations of the transponders when one or multiple high-sites becomes inoperative.

2.2 Multiple Base Station Operations Hand-off.

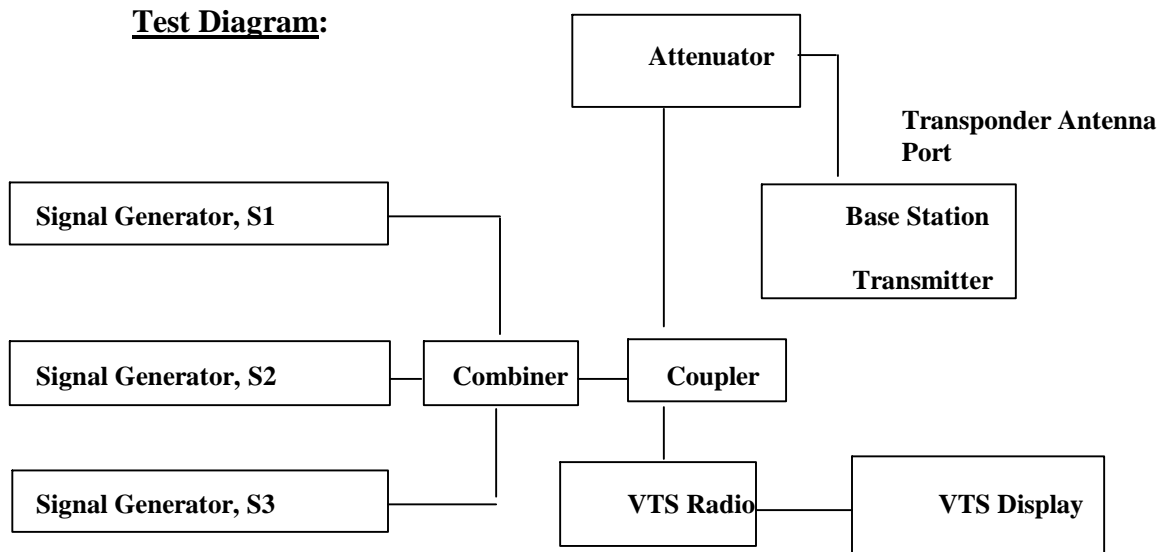
Due to the configuration of the system at C2CEN, this test will not be performed at Portsmouth. Multiple high-sites will be used to cover the VTSA. The purpose of this test is to ensure that the base stations can “hand-off” transponders between themselves as they transverse the RF coverage areas between the high-sites. More detailed test procedures will be developed for this specific test in the Lower Mississippi River Waterway VTSA.

2.3 Susceptibility to Interference from High-Power Emitters.

The transponder must be able to operate in the New Orleans area in the presence of high power emitters. This test will simulate the electromagnetic environment

that the transponder would see near or remote to the Gretna Light facility. The Test Diagram and Test Procedures are shown below in Figure 2-1. This test will be performed at the base station tower and use a direct connection to the antenna port of the transmitter to provide a strong desired signal (a minimum of -107 dBm at the receiver input).

FIGURE 2-1 TEST DIAGRAM AND TEST SCRIPT PROCEDURES



Test Procedures Script:

1. The transponder will be operating on the working channel and communicating with the base station with the coupler input terminated in a 50 ohm load. The base station RF output will be connected into a RF attenuator to reduce its power.
2. The frequency of signal generator one will be set to 161.3625 MHz and be modulated by a 400 Hz tone adjusted in amplitude to produce a 3 kHz signal deviation. The power will be set to -27 dBm at the RF input of the transponder radio. This will simulate a pager.
3. The frequency of signal generator two will be set to 160.8625 MHz and be modulated by a 400 Hz tone adjusted in amplitude to produce a 3 kHz signal deviation. The power will be set to -27 dBm at the RF input of the transponder radio. This will simulate a pager.
4. The frequency of signal generator three will be set to 162.550 MHz and be modulated by a 400 Hz tone adjusted in amplitude to produce a 3 kHz signal deviation. The power will be set to -15 dBm at the RF input of the transponder radio. This will simulate a weather broadcast.
5. The combined output of all the three signal generators will be connected to the coupler. The other input to the coupler will be connected to the transponder antenna. The output of the coupler will be connected to the RF input of the transponder radio.
6. The screen display of the transponder will be observed to ensure that the transponder is still communicating with the base station.

7. The base station software will exercise the transponders through the steps listed in section 3.1 of this document.

The AIS system at C2CEN operates on channel duplex 225. The mobile receive frequency for this channel is 161.8625 MHz. Signal generators one and two are set to frequencies that could generate a third order intermodulation product on this frequency in the mobile receiver. The transponder must be positioned so that it can have a clear view of the sky to acquire the GPS signal.

2.4 Signal Degradation.

Depending on the location of the transponder and the high-site(s), the transponder may lose contact with the base station due to fading, shielding, or multi-path interference. Contact with the base station could be lost as the transponder passes under a bridge or in front of tall buildings due to these effects. The transponder should be able to overcome these brief periods of signal degradation and continue to operate. The transponders will be tested for brief periods of signal degradation, if a location can be found in Portsmouth where these effects occur.

2.5 Co-site Emitters.

The transponders will be operated on ships that will, at some time, be radiated by radars and other navigation aids/systems. These radars/systems produce electric fields that may be sufficient enough to generate harmful currents within the transponder or its associated components. An additional concern is the operation of the voice VHF radios while the transponders are transmitting. Voice VHF communications will be tested between the two ships while the transponders are operating. However, it should be noted that the results of this test would be dependent on the quality of the VHF radios and the placement of the transponder's and radio's antenna.

Additional co-site tests will be performed at C2CEN if the resources are available. Otherwise, test procedures for transponder operations with co-site emitters will be developed for the Gretna Light, New Orleans transponder evaluation tests.

2.6 Environmental Tests.

The transponders must operate in a commercial marine environment. This includes 24-hour operations in wet, damp, and foggy conditions. The weather in New Orleans can be extremely humid in the summer with severe thunderstorms. The transponders must be tested in these conditions. Detailed test procedures for transponder operations in severe weather will be developed for the tests in New Orleans.

3. Phase I and II Schedule and Test Stages.

The testing will be performed in five test event stages. The specific tasks to be accomplished for each stage and scheduled time are described below.

Test Stage 1:

- Unpack the transponders and check that all parts and components are present.
- Install and test the diagnostic software in the base station.
- Charge transponder battery systems, if necessary.
- Scheduled Time: 1st day AM

Test Stage 2:

- Install and operate the transponders on a static platform, either in a parked vehicle or on a docked ship. Operate with a mobile vehicle, if applicable.
- Exercise the transponders through revised 825-1 messages, ship calls, and simplex/duplex operations using the base station test software.
- Test the transponders susceptibility to high power emitter interference.
- Scheduled Time: 1st day PM.

Test Stage 3:

- Install and operate the transponders on ships.
- Exercise the transponders through revised 825-1 messages, ship calls, and revised 1084-1 simplex/duplex operations using the base station test software as the ships maneuver through the Portsmouth harbor area (Phase I First Article Test).
- If time permits, find the range of the base station signal coverage by moving the ships away from the high-site.
- Conduct transponder fading tests near bridges and buildings (Phase II Test).
- Test VHF voice communications during transponder operations (co-site test).
- Conduct signal degradation test.
- Conduct co-site emitters test
- Scheduled Time: 2nd Day

Test Stage 4:

- Evaluate the performance of the transponders and their compliance to revised 825-1 and revised 1084-1 by reviewing the outputs of the diagnostic software and testers notes.
- Prepare written summary of transponders performance and compliance to revised 825-1 and revised 1084-1 to G-AVT.
- Scheduled Time: The same day as the test for the First Article Test Report. One week for the Lessons Learned Report.

Most tasks in Stage 1 - 4 will be performed at the C2CEN. The First Article Test Report with test results will be forwarded (by FAX or e-mail) the same day as the test to G-AVT from C2CEN. The Lessons Learned Report will include both

Phase I and II test results. Stages 1 - 4 will be accomplished through coordinated efforts of Coast Guard, NTIA and SETA.

4. Equipment and Facilities.

The following test equipment depicted in Table 4-1 with the responsible organization will be used to perform the tests:

TABLE 4-1 TEST EQUIPMENT AND RESPONSIBLE ORGANIZATION

Test Equipment	Responsible Organization
1. Three 8662A signal generators	NTIA/ITS
2. Spectrum analyzer & lap top computer	NTIA/ITS
3. RF coupler	NTIA/ITS
4. RF combines	NTIA/ITS
5. Fixed and step RF attenuates	NTIA/ITS
6. Cabling and connectors	NTIA/ITS
7. Power strip and extension cords	NTIA/ITS
8. GPS receivers	G-SCE
9. VHF radios	G-SCE
10. Four cellular telephones	G-SCE
11. Two moderate sized ships for transponder installation	G-SCE
12. Still Cameras	SETA
13. Digital Camera	G-AVT
14. Video Recordings	G-AVT
15. Lap-top PC's	G-AVT/SETA
16. Electronic Chart of Portsmouth Area	G-AVT

5. Test Logs Documentation.

The test results will be documented using the First Article Test Checklist and the Additional Test Checklist (both at Encl. 4). The First Article Test Operator's Log and Transponder Data Log (both at Encl. 5), printouts and checklists are:

- Logbooks kept by each transponder operator that details the transponder operations, test activities, and any problems that occurred.
- A logbook(s) kept by the base station operator that details the base station operations, test activities, and any problems that occurred.
- A computer printout or ASCII data file generated by the base station test software that contains the records of all interactions between the base station and the transponders.
- A First Article Test Checklist for revised 825-1 and revised 1084-1 verification.
- The Additional Tests Checklist for transponder technical and operational verification and review.

- Still pictures (slides), digital pictures and video recordings to highlight the transponders appearance and operations.

**ENCLOSURE (4) – TYPE 1 CONFIGURATION (CARRY-ON)
TRANSPONDER PHASE I FIRST ARTICLE TEST CHECKLIST AND
PHASE II ADDITIONAL TESTS CHECKLIST**

1. The Type 1 Configuration (Carry-on) Transponder Phase I First Article Test Checklist is Attachment 4-A to this enclosure. The checklist and test procedures script should be reproduced (multiple copies) as a stand-alone document for conduct of the First Article Test.
2. The Type 1 Configuration (Carry-on) Transponder Phase II Additional Tests Checklist is Attachment 4-B to this enclosure. The checklist should be reproduced (multiple copies) as a stand-alone document for conduct of the Additional Tests.

**ATTACHMENT 4-A - TYPE 1 CONFIGURATION (CARRY-ON)
TRANSPONDER PHASE I FIRST ARTICLE TEST
CHECKLIST**

PHASE I FIRST ARTICLE TEST CHECKLIST			Page 1 of 4
Verification Items Draft Revision of Recommendation ITU-R M.1084-1	YES	NO	COMMENTS
<p>Verify The VHF/DSC radio provides 25 kHz capability. Base station operator receives signal from the transponder on one channel and transmits to the transponder on another channel:</p> <p><u>Channels</u></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>			<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>Verify the VHF/DSC radio provides 12.5 kHz capability. Base station operator receives signal from the transponder on one channel and transmits to the transponder on another channel.</p> <p><u>Channels:</u></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>			<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>C2CEN has a permanent transponder operating from a rooftop antenna. This transponder will be used as an integrity monitor to ensure the base station is operating properly in the event the first article units fail to operate.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>			<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

PHASE I FIRST ARTICLE TEST CHECKLIST			Page 2 of 4	
Verification Items for Draft Revision of Recommendation ITU-R M.825-1 Annex 1 and Annex 2 Software Test Steps				
Step	Description	Response	Y	N
1.	Test the ability to ignore a Geographical Area call that does not include its position.	The transponder should not respond to this call.		
2.	Test the ability to respond to a Geographical Area call that does include its position.	The transponder should respond with its current position.		
3.	Request the Course information.	The transponder should respond with its current course.		
4.	Test the ability to respond to a course qualifier along with the Geographical Area call.	The transponder should respond with its current position.		
5.	Request the Course information.	The transponder should respond with its current course.		
6.	Test the ability to ignore a Geographical Area call that specifies a course greater than 2 degrees the transponder is making.	The transponder should not respond.		
7.	Test the ability to respond to Ship Type qualifier along the Geographical Area call.	The transponder should reply with its current position.		
8.	Test the ability to ignore a Geographical Area call that includes a ship type not of the transponders.	The transponder should not respond.		
9.	Request the transponder to switch to a specified 25 kHz VHF channel.	The transponder should respond with the specified working channel.		
10.	Request the vessel's Next Port.	The transponder should respond with the vessel's Next Port.		
11.	Request the vessel's Length.	The transponder should respond with the vessel's Length.		
12.	Request the vessel's Name.	The transponder should respond with the vessel's Name.		
13.	Request the vessel's Current Destination latitude and longitude.	The transponder should respond with the vessel's Current Destination latitude and longitude.		
14.	Request the vessel's Speed.	The transponder should respond with the vessel's Speed.		
15.	Request the vessel's Draft.	The transponder should respond with the vessel's Draft.		
16.	Request the vessel's Next Port, Length, Name and Draft.	The transponder should respond with the vessel's Next Port, Length, Name and Draft.		
17.	Request the vessel's Position, Course and Speed.	The transponder should respond with the vessel's Position, Course and Speed.		
18.	Request the transponder to switch to a specified 12.5 kHz VHF channel.	The transponder should respond with the specified working channel.		
19.	Request the vessel's Next Port, Length, Name and Draft.	The transponder should respond with the vessel's Next port, Length, Name and Draft.		
20.	Request the vessel's Position, Course and Speed.	The transponder should respond with the vessel's position, Course and Speed.		
		Legend: Y = Yes and N = No		

PHASE I FIRST ARTICLE TEST CHECKLIST			Page 3 of 4	
Verification items for Draft Revision of Recommendations ITU-R M.825-1 Annex 1 and Annex 2 Software Test Steps				
Step #	Description	Response	Y	N
21.	Request the transponder to use Low Power.	The transponder should acknowledge the Low Power command.		
22.	Request the transponder to use High Power.	The transponder should acknowledge the High Power command.		
23.	Request the vessel's Heading.	The transponder should respond with the vessel's Heading.		
24.	Request the transponders GPS's Antenna Placement.	The transponder should respond with the GPS's Antenna Placement.		
25.	Request the vessel's Beam.	The transponder should respond with the vessel's Beam.		
26.	Send a short Text Message to the transponder.	The transponder should acknowledge that it received the Text Message.		
27.	Request the transponder to respond with its alternate system capabilities.	The transponder should respond with one or more alternate systems.		
28.	Request the transponder to activate the Annex 2 type system using group number 0 and sequence number 2.	The transponder should acknowledge it is switching to Annex 2 operations using group number 0 and sequence number 2.		
29.	Request the transponder's Position.	The transponder should respond with its Position.		
30.	Send a short Text Message to the transponder.	The transponder should acknowledge that it has received the Text Message.		
31.	Send a Transponder Information Update commanding the transponder to switch to group 120, use sequence number 120 and use Low Power.	The transponder should acknowledge that it has received the command.		
32.	Request the transponder's position.	The transponder should respond with its Position.		
33.	Send a Transponder Information update commanding the transponder to switch to group 0, using sequence number 2 and use High Power.	The transponder should acknowledge that it has received the command.		
34.	Request the transponder's Position for a period of 2 minutes at an interval of 10 seconds.	The transponder should respond with its Position information every 10 seconds.		
35.	The transponder should demonstrate the ability to send a short Text Message to the Test Base station.	The base station operator is able to read the message that was sent.		
36.	The transponder should demonstrate the ability to send a short Text Message to another transponder.	Each transponder operator is able to read the message that was sent.		
37.	Command the transponder to return to Annex 1 system operations.	The transponder should acknowledge the command.		
38.	Verify that the transponder will respond to all available Ship Type for a Geographical Area call.	The transponder should respond to each Ship Type as requested.		
		Legend: Y = Yes and N = No		

PHASE I FIRST ARTICLE TEST CHECKLIST			Page 4 of 4	
Verification Items for Draft Revision of Recommendation ITU-R M.825-1 Annex 1 and Annex 2 Random Selection of Software Test Steps				
S	Description	Response	Y	N

Note: Steps from the previous software test checklist will be selected and added to the checklist. The base station operator will initiate action to accomplish the specific command.

ATTACHMENT 1 PHASE I FIRST ARTICLE TEST INFORMATION		Page 1 of 3
S Y M *	Revised 825-1 Annex 1 Symbols for Message Contents Of VTS Calls	COMMENTS
100	My position is.....at time....(followed by 12 or 13 symbols)	
101	Switch to VHF channel.....for subsequent VTS DSC communications	
102	Report your position now and at intervals of....minutes	
103	Report your position	
104	VTS expansion messages (listed in A. below)	
105	Ship is leaving berth or anchorage or entering VTSA	
106	Report next port of call	
107	Ship is berthing, anchoring or leaving VTSA	
108	Report length of ship	
109	Report course of ship	
110	Message acknowledged	
111	Report ships name/identification	
112	Acknowledge message	
113	Report your designation information	
114	My destination information is....followed by 13 symbols	
115	Ships name/identification is....followed by several symbols	
116	Report speed of ship	
117	Not to be used	
118	Report draught (draft) of ship	
119	Course of ship is....degrees	
120	Speed of ship is....knots	
121	Next port of call is....	
122	Not to be used	
123	Draught (draft) of ship is....meters and decimeters	
124	Length of ship is....meters and decimeters	
	* Symbol	
	A. Annex 1 Symbols for VTS Expansion Messages	B. Notes:
00	Frequency channel	1. The test software will exercise the transponder through these messages and record (in time) when messages were sent or received.
01	Transmitter power level	2. Messages can be entered manually by the base station operator and actions recorded on a Log, if applicable.
02	Differential corrections	3. A message may contain up to four symbols in a transmission sequence.
03	Activate alternate system	
04	Identification of alternate system	
05	Ships heading	
06	Navigation antenna placement	
07	Ship's beam	
08	Data text message	
09	Spares	

ATTACHMENT 1 PHASE I FIRST ARTICLE TEST INFORMATION		Page 2 of 3
S Y M *	Revised 825-1 Annex 2 Symbols for VTC Command List, Transponder Command List and Transponder Request List	COMMENTS
	<u>VTC Command List</u>	
100	Position request from list of transponder units	
102	Text data for a transponder from VTC	
104	System information update	
106	Text data from a transponder to a transponder	
108	Resume annex 1 operation	
109	Ports data	
110	Weather data	
120	Update of transponder information	
122	VTC command acknowledgment to a transponder	
124	Differential Corrections	
	* Symbol	
	<u>Transponder Command List</u>	
100	Position data response	
102	Text data for VTC	
104	Text data for transponder	
106	Updated transponder information	
108	Transponder command acknowledgment to VTC	
	<u>Transponder Request List</u>	
01	Request to send text data to VTC	
02	Request to send text data to another transponder	
03	Request for all transponder information update	
Notes: <ol style="list-style-type: none"> The features of Annex 2 are: full compliance with Annex 1 including 1200 baud operation, provision of a means of transmitting ports and weather maps to ships, provision of means of transmitting data messages ship-to-shore, shore-to-ship, and ship-to-ship, and provision of four ships' position reports per second. A complete description of the messages and the format of commands can be found in Annex 2 of the revised 825-1. 		

ATTACHMENT 1		Page 3 of 3
PHASE I FIRST ARTICLE TEST INFORMATION		
<p>1. Ability to Recognize Annex 1 Ship Calls</p> <p><u>Sequence of Events:</u></p> <p>Annex 1 and Annex II allows calls to be made or groups of ships in a defined area. The ship types as categorized by the revised 825-1 Annex 1 are shown to the right.</p> <p>To test compliance to Annex 1 ship calls, the transponder operator will change the configuration of the transponder so that it can be made to emulate each of the listed ships.</p> <p>The base station will then send out calls to each specific ship type to test the transponder ability to recognize itself as that type of ship and respond to the appropriate command/instruction.</p> <p>The base station test software will time-tag the calls and responses to each specific ship type. This recording will be used to verify that the transponder was able to answer calls to each ship type.</p> <p>Annex 1 also allows calls to be made to a ship(s) on a particular course in a defined area.</p>	<p>Symbols to be used by ships to report their type and in the address of calls directed to a group of ships in a VTSA</p>	
	Symbol	Special Craft

	50 51 52 53 54 55 56 57 58 59	Pilots boats Search and rescue vessels Tugs Port Tenders Vessels with anti-pollution facilities or equipment Law enforcement vessels Spare for local vessels Spare for local vessel Medical transports Spare for assignment to other special vessels
	Other Ships	
	1st Digit	2nd Digit
<p>2. Ability to Recognize Annex 2 Ship Calls</p> <p><u>Sequence of Events</u></p> <p>Compliance to Annex 2 will be tested by commanding the transponder through message formats depicted on the checklist. Ships are addressed in Annex 2 by calling a group and sequence number. The transponders are assigned both a group number and sequence number by the base station when a transponder is switched to operation in accordance with Annex 2.</p> <p>Test text messages will also be sent ship-to-shore, shore-to-ship, and ship-to-ship via a repeater through the base station. The base station test software will monitor and record the time transmissions and the message itself.</p>	6-Pass-enger ship 7-Cargo ship 8-Tank-ers 9- Other types of ships	0- all ships this type 1- carrying DG, Hs, or MP IMO hazard or pollutant category A 2- carrying DG, Hs, or MP IMO hazard or pollutant category B 3- carrying DG, Hs, or MP IMO hazard or pollutant category C 4- carrying DG, Hs, or MP IMO hazard or pollutant category D 5- Not under command 6- Restricted by her ability to maneuver 7- Constrained by her draught 8- Spare 9- No additional information

<p style="text-align: center;">ATTACHMENT 2 PHASE I FIRST ARTICLE TEST PROCEDURES SCRIPT</p>	<p style="text-align: center;">Page 1 of 1</p>
<p style="text-align: center;"><u>Test Procedures Script</u></p> <p>There will be one transponder operator/tester on each of the two ships supporting the Phase I First Article Test. The checklist will be used to record the findings for each of the steps. The base station and transponder operators will use the First Article Test Operator Log to record applicable actions/results/time. The transponder operator will use the Transponder Data Log to record applicable functions. The following test procedures will be used as a test script in conjunction with the base station system and test software to test transponders.</p> <p>A. <u>Ship-to-Shore and Shore-to-Ship Tests.</u></p> <p>For Annex 1 Tests:</p> <ol style="list-style-type: none"> 1. The transponder operators (on the ships) will configured the transponder as one of the ship types listed in the previous Enclosure 1, page 3 of 3. 2. The transponder will automatically log onto the system on channel 70 and then go to the working channel when it receives an all-call broadcast from the base station. The base station will instruct the transponder which channel is the working channel. The base station commands and the transponder replies will be recorded by the test software for verification. 3. The base station operator will use the test software to call that particular ship configuration and request information for each of the following parameters (based on revised 825-1 Annex 1 messages shown on the checklist). <ul style="list-style-type: none"> -Position -Heading -Draught (Draft)* -Ships name* -Destination* -Next Port of call* -Entering VTSA -Leaving VTSA -Message acknowledge -No information in some cases * The operator must enter Data into the transponder 4. Test messages will be sent ship-to-shore and shore-to-ship 5. Steps 1,2,3, and 4 will be repeated for each of the ship types shown in the previous Enclosure 1, page 3 of 3. 6. The ships will be set on a course known tot he base station. The base station will call the ships on that course and repeat steps 2 and 3. <p>For Annex 2 Tests:</p> <ol style="list-style-type: none"> 1. The transponders will be instructed by the base station to activate the alternate system. 2. The transponders will be assigned a group and sequence number by the base station. 3. The transponders will be polled by group and sequence number for the information outlined in the command lists, which includes position, speed and heading. Its operator must enter information on vessel type (as identified in Annex 1), length, draught (draft), and name into the transponder. This is an enhancement of the information given in annex 1 requests. <p>The base station software will monitor the communications between the transponder and the base station to validate that the transponder is working in accordance with Annex 2 and providing the correct information.</p> <p>B. <u>Ship-to-Ship Test</u></p> <p>For this part of the testing the base station acts as a repeater between the ships. This allows the ships to share and request information between each other without the base station being directly involved. In this case one of the ships will request the information outlined in Annex 2 and text messages will also be sent ship-to-ship. The base station will monitor and record the communications between the ships to verify operations.</p>	

ATTACHMENT 3 PHASE I FIRST ARTICLE TEST DESCRIPTION		Page 1 of 9
Step	Description	
1.	<p>Call Description: Use a geographical area address call, which defines an area that does not include the transponder's position. This call requests the transponder's position.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should not respond to this call.</p>	
2.	<p>Call Description: Use a geographical area addressed call, which defines an area that does include the transponder's Position. This call requests the transponder's Position</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should respond with its Position. If available the transponder should include its Ship Type.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 100</p>	
3.	<p>Call Description: Use a selective address call to the transponder requesting its Course. This information will be used for the next step.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> 109</p> <p>Expected results: Yes/No The transponder should respond with its Course information.</p> <p>Annex 1 Symbols used for response. <u>Table 4</u> 119</p>	

4.	<p>Call Description: Use a geographical area address call which defines an area that includes the transponder's Position and specifies a course that is within two degrees of the course that the transponder is making. Annex 1 Symbols used for request:</p> <p><u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should respond with its Position information. If available, the transponder should include the Ship Type.</p>
4. Cont .	<p>Annex 1 Symbols used for response: Page 2 of 9</p> <p><u>Table 4</u> 100</p>
5.	<p>Call Description: Use a selective address call to the transponder requesting its Course. This information will be used for the next step.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> 109</p> <p>Expected results: Yes/No The transponder should respond with its Course information.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 119</p>
6.	<p>Call Description: Use a geographical area address call which defines an area that includes the transponder's position and specifies a Course that is five degrees greater than the Course that the transponder is making.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should not respond.</p>
7.	<p>Call Description: Use a geographical area address call which defines an area that includes the transponder's Position and specifies the Ship Type of the transponder.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should respond with its Position information. If available, the transponder should include its Ship Type.</p> <p>Annex 1 Symbols used for response. <u>Table 4</u> 100</p>

8.	<p>Call Description: Use a geographical area address call which defines an area that includes the transponder's Position that specifies a Ship Type that is not of the transponder's Ship Type.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103</p> <p>Expected results: Yes/No The transponder should not respond.</p>	
9.	<p>Call Description: : 9</p> <p>Use a selective call to the transponder, requesting it to switch a specified 25 kHz VHF channel.</p> <p>Annex 1 Symbols used for request <u>Table 4</u> 101</p> <p>Expected results: Yes/No The transponder should switch to the new working channel and respond with the new working channel that was specified.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 101</p>	Page 3 of
10.	<p>Call Description: Use a selective call to the transponder requesting its Next Port.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 106</p> <p>Expected results: Yes/No The transponder should respond with its Next Port.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 121</p>	
11.	<p>Call Description: Use a selective call to the transponder requesting its vessel's Length.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 108</p> <p>Expected results: Yes/No The transponder should respond with its vessel Length.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 124</p>	

12.	<p>Call Description: Use a selective call to the transponder requesting its vessel Name.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 111</p> <p>Expected results: Yes/No The transponder should respond with its vessel Name.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 115</p>
13.	<p>Call Description: Use a selective call to the transponder requesting its Current Destination.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 113</p>
13. Con d	<p>Expected results: Yes/No The transponder should respond with its Current Destination.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 113</p>
14.	<p>Call Description: Use a selective call to the transponder requesting its Speed.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 116</p> <p>Expected results: Yes/No The transponder should respond with its Speed.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 120</p>
15.	<p>Call Description: Use a selective call to the transponder requesting its Draft.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 118</p> <p>Expected results; Yes/No The transponder should respond with its Draft.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 123</p>

16.	<p>Call Description: Use a selective call to the transponder requesting its Next Port, Length, Name and Draft.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 106, 108, 111, and 118</p> <p>Expected results: Yes/No The transponder should respond with Next port, Length, Name, and Draft.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 121, 124, 115 and 123</p>
17.	<p>Call Description: Use a selective call to the transponder requesting its Position, Course and Speed.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103, 109 and 116</p> <p>Expected results: Yes/No The transponder should respond with its Position, Course and Speed.</p> <p>Annex 1 Symbols used for response <u>Table 4</u> 100, 119 and 120</p>
18.	<p>Call Description: : Page 5 of 9</p> <p>Use a selective call to the transponder requesting it to switch to a specified 12.5 kHz VHF channel.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> <u>Table 5</u> 104 00</p> <p>Expected results: Yes/No The transponder should switch to the new working channel and respond with the new working channel that was specified.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> <u>Table 5</u> 104 00</p>
19.	<p>Call Description: Use a selective call to the transponder requesting its Next Port, Length, Name and Draft.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 106, 108, 111 and 118</p> <p>Expected results: Yes/No The transponder should respond with its Next Port, Length, Name and Draft</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 121, 124, 115 and 123</p>

20.	<p>Call Description: Use a selective call to the transponder requesting its Position, Course and Speed.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> 103, 109 and 116</p> <p>Expected results: Yes/No The transponder should respond with its Position, Course and Speed.</p> <p>Annex 1 Symbols used for response: <u>Table 4</u> 100, 119 and 120</p>
21.	<p>Call Description: Use a selective call to the transponder requesting it to change current transmitter power to 1 watt.</p> <p>Annex 1 Symbols used for request: <u>Table 4</u> <u>Table 5</u> 104 01</p> <p>Expected results: Yes/No The transponder should switch its transmitter power to 1 watt and respond with the same information to acknowledge that it has completed the command.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 01</p>
22.	<p>Call Description: Page 6 of 9 Use a selective call to the transponder requesting it to change current transmitter power to 25 watts.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 01</p> <p>Expected results: Yes/No The transponder should switch its transmitter power to 25 watts and respond with the same information to acknowledge that it has completed the command.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 01</p>
23.	<p>Call Description: Use a selective call to the transponder requesting its Heading</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 05</p> <p>Expected results: Yes/No The transponder should respond with its current Heading, if it is available.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 05</p>

24.	<p>Call Description: Use a selective call to the transponder requesting its Antenna Placement.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 06</p> <p>Expected results: Yes/No The transponder should respond with its Antenna Placement.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 06</p>
25.	<p>Call Description: Use a selective call to the transponder requesting its Ship's Beam.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 06</p> <p>Expected results: Yes/No The transponder should respond with its Ship's Beam</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 06</p>
26.	<p>Call Description: : Use a selective call to the transponder to deliver a short Text Message</p> <p>Annex 1 Symbols used for the request <u>Table 4</u> <u>Table 5</u> 104 08</p> <p>Expected results: Yes/No The transponder should acknowledge that it received the Text Message.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 110 ?????</p>
27.	<p>Call Description: Use a selective call to the transponder to inquire of its alternate system capabilities.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 04</p> <p>Expected results: Yes/No The transponder should respond with its alternative system types that are available.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 04</p>

28.	<p>Call Description: Use a selective call to the transponder to activate the Annex 2 system using a group number of 0 and a sequence number of 2.</p> <p>Annex 1 Symbols used for the request: <u>Table 4</u> <u>Table 5</u> 104 03</p> <p>Expected results: Yes/No The transponder should respond with the same group number and sequence number to acknowledge its switching to Annex 2 operations.</p> <p>Annex 1 Symbols used for the response: <u>Table 4</u> <u>Table 5</u> 104 03</p>
29.	<p>Call Description: Request position information from the transponder.</p> <p>Annex 2 Symbols used for the request: <u>Table 1</u> 100</p> <p>Expected results: Yes/No The transponder should respond with its position information.</p> <p>Annex 2 Symbols used for the response: <u>Table 2</u> 101</p>
30	<p>Call Description: Send a short Text Message for the Workstation to the transponder Annex 2 Symbols used for the request <u>Table 1</u> 102</p> <p>Expected results: Yes/No The transponder should acknowledge it has received the Text Message.</p>
30.	<p>Annex 2 Symbols used for the response: Page 8 of 9 <u>Table 2</u> 123</p>
31.	<p>Call Description: Send System Information Update commanding the transponder to switch to group 120, use Sequence Number 120, and use low power.</p> <p>Annex 2 Symbols used for request: <u>Table 1</u> 120</p> <p>Expected results: Yes/No The transponder should acknowledge the command.</p> <p>Annex 2 Symbols used for the response: <u>Table 2</u> 123</p>

32.	<p>Call Description: Request Position information from the transponder.</p> <p>Annex 2 Symbols used for the request: <u>Table 1</u> 100</p> <p>Expected results: Yes/No</p> <p>The transponder should respond with its Position information.</p> <p>Annex 2 Symbols used for the response: <u>Table 2</u> 101</p>
33.	<p>Call Description: Send System Information Update commanding the transponder to switch to group 0, use Sequence number 2 and use high Power.</p> <p>Annex 2 Symbols used for the request: <u>Table 1</u> 120</p> <p>Expected results; Yes/No</p> <p>The transponder should acknowledge the command.</p> <p>Annex 2 Symbols used for the response: <u>Table 2</u> 123</p>
34.	<p>Call Description: Go into a loop of requesting position Information from the transponder every 10 seconds.</p>
35.	<p>Call Description; The transponder should demonstrate the ability to send text information to the AIS shore station.</p>
36.	<p>Call Description: Page 9 of 9 The transponder should demonstrate the ability to send text information to another transponder.</p>
37.	<p>Call Description: Command the transponder to return to Annex 1 operations.</p>
38.	<p>Call Description: Command the transponder to respond to all ship types for a geographical call.</p>
39.	<p>Call Description; TBD.</p>
40.	<p>Call Description; TBD.</p>

Note: Commands for Steps 34 to 38 will be revised, as more information is known. Additional steps may be added, if applicable.

ATTACHMENT 4-B – TYPE 1 CONFIGURATION (CARRY-ON) TRANSPONDER PHASE II ADDITIONAL TESTS CHECKLIST

PHASE II ADDITIONAL TESTS CHECKLIST			Page 1 of 1
VERIFICATION ITEMS	YES	NO	COMMENTS
Verify the Type 1 configured transponder will operate in the presence of high-powered signals described in Enclosure 3 for Phase II testing.			

Verify the Type 1 configured transponder component operating separately from the ship's power source has a self-contained power source that provides a minimum of 8 hours of non-interrupted use.			
Verify the Transponder display subsystem is capable of displaying electronic chart formats.			
Verify all three subsystems of the Type 1 configured transponder is capable of quick, easy mounting for installation and connecting to ship's power.			
Verify the self-contained power source is rechargeable using 110 – 240 AC power sources.			
Verify that the Type 1 configured transponder is in a hard shell container and does not weigh more than 20 pounds, inclusive of all three physical components.			
Verify the Type 1 configured transponder will operate in a marine environment			
Review that the carry-on unit external physical components most likely (probable expectation) will withstand sustained winds up to 65 knots.			
Verify the transponder component, power cable, or information cable or wire does not lie on the vessel deck, interfere with the operation of the vessel, or present any tripping hazard.			
Review RMA Predictions that the Type 1 configured transponder system most likely (probable expectation) will have an inherent availability of at least 99.75% in an operational environment.			

ENCLOSURE (5) - FIRST ARTICLE TEST OPERATOR'S LOG AND TRANSPONDER DATA LOG

1. The First Article Test Operator's Log is Attachment 5-A to this enclosure. This Log should be reproduced (multiple copies) as a stand-alone document for conduct of the Phase I First Article Test and Phase II Additional Tests.
2. The Transponder Data Log is Attachment 5-B to this enclosure. This Log should be reproduced (multiple copies) as a stand-alone document for conduct of the Phase I First Article Test and Phase II Additional Tests.

ATTACHMENT 5-A FIRST ARTICLE TEST OPERATOR'S LOG

Operator' Action	Time	Response/Result	Time

ATTACHMENT 5-B TRANSPONDER DATA LOG

Operator name _____ (print)

Date _____

Time _____

Transponder Log-in

Transponder powered at _____ (Time)

Transponder logged into system via channel 70 at _____ (Time)

Transponder on duplex working channel _____ (indicate channel) at _____ (Time)

Transponder on simplex working channel _____ (indicate channel) at _____ (Time)

Transponder Configuration for Ship Types

Operator as a specific ship type must configure transponder before tests are begun. Place check by ship type to indicate test completed.

Pilot boats _____

Search and rescue vessels _____

Tugs _____

Port Tenders _____

Vessels with anti-pollution facilities or equipment _____

Law enforcement vessels _____

Spare for local vessels _____

Spare for local vessels _____

Medical transports _____

Spare for assignment to other special vessels _____

The following types can further addressed by one of the eight categories. The transponder operator must set the configuration.

	0	1	2	3	4	5	6	7	8
Passenger ship(s)	_____	_____	_____	_____	_____	_____	_____	_____	_____
Cargo ships	_____	_____	_____	_____	_____	_____	_____	_____	_____
Tankers	_____	_____	_____	_____	_____	_____	_____	_____	_____
Other types of ships	_____	_____	_____	_____	_____	_____	_____	_____	_____

0- all ships this type

1- carrying DG, Hs, or MP IMO hazard or pollutant category A

2- carrying DG, Hs, or MP IMO hazard or pollutant category B

3- carrying DG, Hs, or MP IMO hazard or pollutant category C

4- carrying DG, Hs, or MP IMO hazard or pollutant category D

5- Not under command

6- Restricted by her ability to maneuver

7- Constrained by her draught (draft)

8- Spare

9- No additional information

Voice Communications Test

Tune radio to channel and establish voice contact with other ship while transponder is on working channel. Listen to audio of VHF voice receiver. Channel 68 (Noted if otherwise).
Observations (good or bad voice intelligibility, interference present, squelch setting, etc..)

Testing Notes: (location of transponder antenna, location of VHF voice antenna, problems, observations, location, personnel present, weather conditions)

Failures: Note any failures that are observed.

<u>Date</u>	<u>Time</u>	<u>Duration</u>	<u>Action to Restore Operation</u>	<u>Comment</u>
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